

WHAT IS CLAIMED IS:

1. A pump light source device for outputting a pump light to amplify signal lightwaves transmitted into an optical fiber utilizing Raman scattering comprising:

two pump light sources,

a polarization beam combiner or a polarization-maintaining optical beam coupler to which two lightwaves are input and where the two lightwaves are combined with orthogonal state of polarization or maintained the same state of polarization of input, and

a depolarizer adapted to depolarize and output the input lightwaves with lower degree of polarization.

2. A pump light source device for outputting a pump light to amplify signal lightwaves transmitted into an optical fiber utilizing Raman scattering comprising:

a plurality of pairs of pump light sources,

a plurality of sets of polarization beam combiners or polarization-maintaining optical beam couplers,

a plurality of sets of depolarizers, and

an optical beam coupler for combining a plurality of lightwaves,

the output lightwaves from each pair of light sources being respectively input to each set of the said polarization beam combiners or the said polarization-maintaining optical beam couplers to output a composite lightwave of each set with orthogonal

state of polarization or maintaining the polarization state of inputting, the composite lightwave of each set being respectively input to each set of the depolarizers to output depolarized lightwaves for each set with lower degree of polarization, and the depolarized lightwaves for each set being combined and output by the optical beam coupler.

3. A pump light source device for outputting a pump light to amplify signal lightwaves transmitted into an optical fiber utilizing Raman scattering comprising:

a plurality of pairs of pump light sources,  
a plurality of sets of polarization beam combiners or polarization-maintaining optical beam couplers,  
a depolarizer, and  
a polarization beam combiner or polarization-maintaining optical multiplexer for combining a plurality of lightwaves,  
the output lightwaves from each pair of pump light sources being respectively input to each set of the said polarization beam combiner or the said polarization-maintaining optical beam coupler to output a composite lightwave of each set with orthogonal state of polarization or maintaining the relationship of inputting, after the composite lightwave of each set being combined by the polarization beam combiner or polarization-maintaining optical beam coupler, the combined lightwaves being input to the depolarizer to output lightwaves with lower degree of polarization.

4. A pump light source device for outputting a pump lights to amplify signal lightwaves transmitted into an optical fiber utilizing Raman scattering comprising:

one or a plurality of pairs of pump light sources,

one or a plurality of individual light sources which is/are different therefrom,

one or a plurality of sets of polarization beam combiners or polarization-maintaining optical beam couplers,

depolarizers in a number corresponding to the number of the plurality of pairs of pump light sources plus the number of an individual light source/individual light sources, and

an optical beam coupler for combining a plurality of lightwaves,

the output lightwaves from each pair of pump light sources being respectively input to each set of the said polarization beam combiners or the said polarization-maintaining optical beam couplers to output a composite lightwave of each set with orthogonal state of polarization or maintaining the relationship of inputting, the composite lightwave of each set being input to each set of depolarizers to output depolarized lightwaves for each set with lower degree of polarization, the lightwaves from the individual light sources being respectively input to the depolarizer to output depolarized lightwaves with lower degree of polarization, the depolarized lightwaves for each set, the depolarized lightwave from

the individual light source being combined and the combined lightwaves being output by the optical beam coupler.

5. A pump light source device for outputting a pump lights to amplify signal lightwaves transmitted into an optical fiber utilizing Raman scattering comprising :

one or a plurality of pairs of pump light sources,

one or a plurality of individual light sources which are different therefrom,

a plurality of sets of polarization beam combiners or polarization-maintaining optical beam couplers,

a polarization-maintaining optical multiplexer for combining a plurality of lightwaves, and

a depolarizer,

the output lightwaves from each pair of pump light sources being respectively input to each set of the said polarization beam combiners or the said polarization-maintaining optical beam couplers to output a composite lightwave of each set with orthogonal state of polarization or maintaining the relationship inputting, the composite lightwave of each set and the lightwaves output from the individual light sources being combined by the polarization-maintaining optical beam coupler, and the combined lightwaves being input to the depolarizer to output a lightwave with lower degree of polarization as a pump light.

6. A pump light source device for Raman amplification according

to any one of claims 1 through 5, wherein the depolarizer consists of a birefringent material having different refractive indexes at principal axes, and is arranged such that an angle between polarization of each lightwave of the composite lightwave output from the polarization beam combiner or the polarization-maintaining optical beam coupler and the optical principal axis of the birefringent material is 45 degrees, the composite lightwave being depolarized in the birefringent material.

7. A pump light source device for Raman amplification according to claim 6, wherein the birefringent material consists of rutile.

8. A pump light source device for Raman amplification according to claim 6, wherein the birefringent material consists of calcite.

9. A pump light source device for Raman amplification according to claim 6, wherein the birefringent material consists of a polarization maintaining optical fiber.

10. A pump light source device for Raman amplification according to any one of claims 1 through 9, wherein the depolarizer consists of a LYOT type depolarizer in which two birefringent material, the length of one of them differed from that of the other in ratio of more than 1:2, are connected such that the respective optical principal axes differ from each other by 45 degrees.

11. A pump light source device for Raman amplification according to any one of claims 1 through 10, wherein an optical isolator is provided in one or more of the following: an optical

path on the input side of the depolarizer, an optical line on the output side of the depolarizer, and the interior of the depolarizer.

12. A Raman amplification system comprising:

a light transmitting station for transmitting signal lightwaves, a light receiving station for receiving the signal lightwaves,

an optical fiber for propagating the signal lightwaves from the light transmitting station to the light receiving station, and

a Raman amplification pump light source device for introducing a pump light into the optical fiber to amplify the signal lightwaves using stimulated Raman scattering process, wherein

said Raman amplification pump light source device consists of a pump light source device for Raman amplification as claimed in any one of claims 1 through 10.